



Pacific Island Network News

Newsletter of the
Pacific Island Network
Inventory & Monitoring Program
Jan. - Mar. 2007, Issue no. 07

Board of Director's Note, pg. 2

Tom Workman, Superintendent of Kalaupapa National Historical Park, discusses environmental concerns and preparations at Kalaupapa National Historical Park.

Notes from the Field, pg. 4

Heather Fraser tells us about the exciting future of Hawaiian hoary bat detection and what this may mean for the insectivorous bat monitoring protocol.

Featured Resource, pgs. 6 & 7

Coral reefs are the basis for some truly dynamic nearshore marine ecosystems. Paul Brown tells us about reef ecosystems at the National Park of American Samoa.

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A traditional Hawaiian fishing technique, the Hukilau, at Pu'uuhonua o Hōnauau National Historical Park

Aloha - Talofa - Greetings Tirow - Hafa adai

The Pacific Island Network (PACN) is pleased to release the first network newsletter of 2007. We are excited about the prospects and challenges that await in the new year. After the completion of the PACN Inventory and Monitoring (I&M) program's final Monitoring Plan, we can concentrate collaborative efforts on designing and beginning to implement our Vital Signs monitoring protocols.



The endemic Samoan fruit bat, also known as a flying fox, is one of three species of fruit bats in the PACN, and maybe keystone as a seed disperser to the ecosystems of the National Park of American Samoa. For this and other reasons bats were chosen as one of the network's Vital Signs.





National Park Service
U.S. Department of the Interior

Pacific Island Network
P.O. Box 52
1 Crater Rim Drive - Qtrs 22
Hawai'i National Park, HI 96718



Hawaii-Pacific Islands Cooperative Ecosystem Studies Unit
University of Hawaii at Manoa
3190 Maile Way, St. John Hall #408
Honolulu, HI 96822-2279

The National Park Service has implemented natural resource inventory and monitoring on a servicewide basis to ensure all park units possess the resource information needed for effective, science-based management, decision-making, and resource protection.

Network Coordinator:

Leslie HaySmith 808-985-6180

Pacific Island Network Staff:

Fritz Klasner	808-985-6181
Allison Snyder	808-985-6186
Donna Ashenmacher	808-985-6187
Tahzay Jones	808-985-6188
Sandy Margritter	808-985-6074

Hawaii-Pacific Islands

CESU Cooperators:

Karin Schlappa	808-985-6183
Heather Fraser	808-985-6183
Viet Doan	808-985-6184
Page Else	808-985-6184
Kelly Kozar	808-985-6184
Cory Nash	808-985-6185
Gail Ackerman	808-985-6187
Rise Hart	684-633-7082 (NPSA)
Alison Ainsworth	808-967-7396 x266

NPS Ecologist and PWR Science

Advisor:

Darcy Hu 808-985-6092

Comments? Write to:

Cory Nash, Editor
Pacific Island Network News
P.O. Box 52
Hawai'i National Park, HI 96718
Phone: 808-985-6185
Fax: 808-985-6111
Email: corbett_nash@contractor.nps.gov
Web: <http://science.nature.nps.gov/im/units/pacn/>

Mailing List:

Please pass this newsletter on to interested parties. To be added to or removed from mailing list, please contact Cory Nash.

CONTRIBUTORS: Tom Workman, Tahzay Jones, Cory Nash, Sallie Beavers, Karin Schlappa, Paul Brown, Malia Laber, Heather Fraser, Lloyd Loope, Joan Yoshioka, and Leslie HaySmith

***NOTE:** Unless indicated all photos and articles are NPS

Board of Director's Note

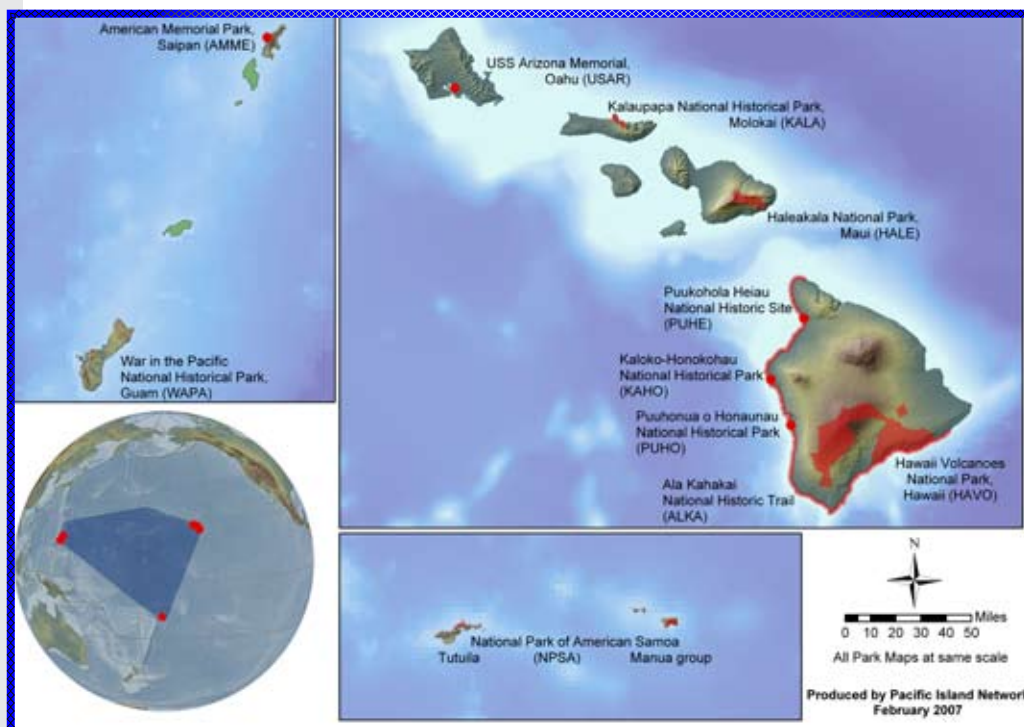
Climate Change & Kalaupapa NHP - Tom Workman, Superintendent

Several recent geologic events and burgeoning public awareness have highlighted the vulnerability of the coastal parks to global climate change. Climate change in Hawaii has become a central issue of paramount importance. Federal and state agencies along with academia, non-governmental organizations, and community leaders have focused research and management efforts to examine potential effects of climate change on both terrestrial and marine ecosystems.

Terrestrial ecosystems in Hawaii may experience increased storm frequency, a shrinking tradewind inversion layer, and warmer local temperatures. In the marine environment, climate change is likely to influence water temperatures, ocean pH, and sea level. Related changes will occur in available coral reef habitat, wave climate, and coastal shorelines. Many of the PACN parks will be adversely affected both in terms of the natural resources and cultural resources.

Efforts at Kalaupapa: Our emergency evacuation plan is being reviewed and updated to protect our most precious resource, the Hansen's Disease patients, from acute and catastrophic storms. We are working with the State of Hawaii Emergency Services and Department of Health in developing a community action plan. Staff will be attending the FEMA training course for Community Emergency Response Team and the Incident Command System. In review of inundation studies, the park balances the preservation of historic structures in the face of rising sea level. We are also in the process of establishing a recycling center and revamping our waste disposal systems. The park will be embarking on an intense recycling education program for the community within the next 10 months with the implementation of Reduce, Reuse, and Recycle. In the long-term, we have begun evaluating reduction of our overall carbon emissions, reducing dependency on fossil fuels, and looking at alternative energy sources such as solar energy. We look to encourage employees to use bicycles, electric vehicles, and to some extent "car pool" through the community.

Utilizing data collected through I&M programs such as landscape dynamics, climate parameters, and monitoring of terrestrial plant communities and marine ecosystems will be critical to developing management strategies in the next few decades.



Map of the 11 Pacific Island Network park units.



Early Detection of Invasive Plants

Background & Description: The National Park Service (NPS) Pacific Island Network (PACN) has the unfortunate distinction of being the group of national parks most vulnerable to plant invasions. For example, the extremely invasive miconia (*Miconia Calvescens*) in Hawaii and tamaligi palagi (*Falcataria moluccana*) in American Samoa have, in recent years, become household words for island residents. NPS resource managers are devoting an ever-increasing portion of their time to turning back the tide of invasions. Certain high-impact invasive plant species may obliterate biodiversity in national parks and other natural areas of Pacific islands in the long run without concerted effort by government agencies, nongovernmental organizations, and the public to address the problem at its root.



The majestic but invasive tamaligi palagi (*Falcataria moluccana*) pictured dead on this steep slope in American Samoa

Most invasive plant species that damage resources of Pacific national parks have been brought to the islands innocently but deliberately by humans. Most plant invasions begin in areas of human habitation. Catastrophic invasions start by what is often initially perceived as harmless spread to the nearby countryside. A particularly embarrassing example is an early introduction of kähili ginger (*Hedychium gardnerianum*) to one of the yards in the Hawai'i Volcanoes NP (Hawai'i Island) housing area in the early 1940s. Now, it is one of the most widespread and pervasive invaders

The attractive but invasive Kähili ginger (*Hedychium gardnerianum*)



in the park's wet and mesic forests. Himalayan raspberry (*Rubus ellipticus*) was originally introduced for its edible berries in the Volcano area just outside Hawai'i Volcanoes NP. It has since been quickly spreading to the rest of the island. However, most plant invasions inside national parks arrive from origins far outside the parks.

On the positive side, islands are like little fortresses of land surrounded by water. They can be defended from conspicuous terrestrial plant invasions through prompt detection and eradication, given the public support to do so. With only minimal international or interstate restrictions, increasing ease of transportation, and access to commercial sources on the internet, the rate of introduction of new plant species to the islands may not be slowing down. Approximately 1100 non-native plant species have been recorded as naturalized in Hawaii, with over 100 causing significant damage in natural areas. A Bishop Museum website (<http://www2.bishopmuseum.org/HBS/botany/cultivatedplants/>) has documented about 10,000 plant species cultivated in gardens of Hawaii. Many of these species, while not yet considered naturalized, are known to be aggressive weeds elsewhere in the world. However, the Bishop Museum list may not be complete, and in reality we have little idea what species are already present in Hawaii. For example, an article in the Dec. 2006-Jan. 2007 Hawaiian Airlines magazine, Hana Hou! (www.hanahou.com) states that just one Big Island resident has 10,000 species of plants on 3 acres of land near Hilo. Another resident is said to have 800 species of palms on 6 acres in Kurtistown. The thirst for exotic species raises the potential for invasions.

Monitoring Protocol: To aid in slowing the spread of invasive plants, the PACN is developing an "Early Detection of Invasive Plants" protocol to help agencies and partnerships address the issue of proliferating plant invasions on an island-wide level. Although cooperative conservation has a strong tradition in the NPS, at the time of

this writing, existing legislation may limit NPS direct involvement in monitoring and management activities outside national park boundaries. Protocol developers are working to provide NPS partners already involved with early detection and rapid response with methodology that can be tailored to their individual needs. The protocol will detail recommended methodologies to survey for targeted species along road corridors and selected "plant distribution centers" (nurseries, garden stores, and botanical gardens). The protocol will also incorporate expert interviews, incidental reporting, and a system for public reporting of target species.

The protocol will supply a structured process for collaborative decision-making to determine appropriate targets for early detection. As a function of this process, a typical target list may consist of as few as 10 species or less, or as many as 100 species or more, depending on the survey area and on the skill of personnel conducting the survey. Availability of experienced or well-trained observers is crucial.

What You Can Do - Identification of Invasive Plants: Voucher collections and photographs are needed to document invasive species detections. The availability of quality identification images of invasive species is a major consideration. Fortunately, an ever-increasing library of search images is becoming available on internet sites (e.g., www.hear.org/starr/hiplants/images).

Example results of a pilot road survey effort on the island of Maui can be found at (www.hear.org/starr/hiplants/maps).

For more information contact:
Lloyd_Loope@usgs.gov



The invasive Chain of love (*Antigonon leptopus*) vine threatens native plants at War in the Pacific National Historical Park (Guam)

Hot Topic

Development in Kona Threatens Historical Park

Kaloko-Honokōhau National Historical Park and the Honokōhau Settlement National Historic Landmark (NHL) face another threat from the growing urbanization of the Kailua-Kona area. If approved, the proposed development would effectively hem in the park by large scale developments. Jacoby Development Inc. has proposed a grand-scale development project on approximately 530 acres immediately adjacent to the park's southern border. It encompasses approximately 15.5 acres of state-owned land within the park's legislated boundary, and the NHL boundary on the southern side of the Honokōhau Harbor entrance. The lands proposed for development include 200 acres owned by the State of Hawaii Depart-

ment of Hawaiian Home Lands, and 330 acres owned by the Department of Land and Natural Resources.

The proposed Kona Kai Ola project includes a new 45-acre, 800-slip marina; a cultural park; a 19-acre water feature that includes seawater "swimming lagoons" for snorkeling with captive sea turtles, rays and other marine life; three hotels and 1,803 timeshare units; more than 60 acres of commercial and industrial enterprises, and additional roadways and infrastructure. The construction build-out is expected to take 15 years. This proposed development is presented in the draft environmental impact statement (DEIS) prepared by Jacoby Inc. in December 2006 as an "all or nothing" development proposal. Jacoby has chosen not to propose or analyze alternatives to this large scale development, stating that "the only valid alternative to the proposed project is the no-action alternative."

Kaloko-Honokōhau NHP has provided a detailed response letter to the DEIS. The potential adverse impacts to the park's cultural and natural resources are numerous and substantial.

Among the many potentially affected resources are approximately 25 anchialine pools within the park's legislative boundary, which are cultural resources as well as home to two known candidate endangered species. These pools would be destroyed by the harbor excavation. To supply the water features, 79 million gallons of seawater per day would be pumped from the ocean, increasing the outflow of Honokōhau Harbor 20-fold. This outflow would also include the runoff from an additional 800 operating vessels, nutrient waste from the marine park and associated features, and urban run-off from the development (including pollutants, pesticides, herbicides, and nutrient enrichment). Since the general flow of water is to the north, these contaminants will move directly into the park and into contact with the coral reef community. Additional impacts include: loss of archeological sites and trails, impacts to protected marine species from construction noise, boat noise, and increased risk of boat strikes; impacts to the soundscape, underwater soundscape, night sky, and viewscape; and to groundwater quantity and quality.

For more information on this proposed project please contact Sallie Beavers at: 808-329-6881 x220.

Notes from the Field

"Wait, did you say bats?" This is a fairly typical response when people ask about my role in cooperation with the NPS I&M Program. This is usually followed by, "So you're saying we have bats in Hawaii?" Yes, as a matter of fact, we do. The endangered Hawaiian hoary bat, *Lasiurus cinereus semotus*, is the only indigenous terrestrial mammal found in Hawaii. It appears to be related to the hoary bat living on the North American mainland, but just exactly how it landed in Hawaii is a mystery. One theory suggests that perhaps a large storm swept a few out to sea, where they eventually found a home on the most isolated chain of islands in the world!

Researching and monitoring bats can be tricky. They are elusive and difficult to capture, are mostly active after dark, are plagued by public fear and misunderstanding, and in some parts of the world they might even show up as the main dinner course. In the PACN, where the Hawaiian hoary bat typically roosts solitarily in small clumps of foliage, we have very little information regarding its population status and natural history. However, there is a glimmer of light at the end of our monitoring tunnel. With current advances in acoustic detection technology, we are working with the Upper Columbia Basin Network and USGS to develop an acoustic-based monitoring protocol. This will allow us to track bat echolocation activity over time in selected areas of national parks in Hawaii. Think of it as eavesdropping on bat chatter as bats hunt for a suitable insect meal or try to find their way back to a favorite roost tree.

In preparation for acoustic monitoring of Hawaiian

hoary bats in the PACN, Leslie HaySmith and I visited John Day Fossil Beds National Monument in August 2006, where we met with ecologist Tom Rodhouse for a crash course in use of the Anabat II detection system. After an intense few days of bat detection training, I brought my newly acquired skills back to Hawaii and just recently put them to use at PUHO.



Heather and Upper Columbia Basin Network ecologist, Tom Rodhouse, discuss plans for recording bat activity at John Day Fossil Beds National Monument

Under the watchful eyes of barn owls circling and twittering as I worked below them, I detected a short series of bat echolocation calls. I was impressed by how the Anabat system allowed us to either view real-time bat calls on a laptop screen or save bat call information to a compact flash card for downloading, viewing, and analysis. This latter approach will be particularly useful to our monitoring protocol, as it allows us to deploy the detection equipment and leave it in the field for weeks at a time. Stay tuned as we begin field testing our proposed monitoring methods using this equipment over the summer.

— Heather Fraser

Featured Staff

Karin Schlappa is a native of Germany. She has been living in Hawaii since 1989 and has worked for various groups and agencies in HAVO since 1993. She joined I&M in early 2004 while still finishing her Master's degree at the University of Hawaii. Her graduate research focused on fog deposition and dry deposition at HAVO. For I&M she does inventory coordination and, in collaboration with Fritz Klasner, works on the climate monitoring protocol.



Program Update

Vital Signs Monitoring: The Landbirds and Benthic marine protocols have returned from peer review, and the reviewers comments are now being considered by the protocol teams. In addition, the Water quality protocol has been submitted for peer review.

Outreach: I&M staff has been busy with outreach this winter. Early in January staff conducted a lecture to a small group of students from Pacific University about the PACN and the I&M program. The GIS team has been even busier with a public presentation in the evening at HAVO, a GIS workshop in HALE, and a GPS training for a small group of at risk youth from Ka'ū at HAVO. In addition, the I&M program brochure was finalized and is now in the presses. It should be ready for public release soon. The PACN website is up and running as well, although much fine-tuning still lies ahead.

Staffing: The PACN will be losing four of our key staff members in the coming months. Our witty and beloved Data Manager, Gordon Dicus, will be moving to the Upper Columbia Basin Network to become their witty and potentially beloved data manager. We will also be saying a sad farewell to one of our long time cooperators

and botanist extraordinaire, Joan Yoshioka, who started a new position for the State of Hawaii in March. Next to hit the road is Allison Snyder who will be upgrading her system to be the Data Manager at the Southern Colorado Plateau Network. Finally, we bid adieu to long-time PACNer, Fritz Klasner, who will be moving to the Kenai Fjords NP to complete his life's work of making the perfect snow angel. Although the PACN will never be the same without these folks, we wish them well in their endeavours. On a brighter note for the PACN, Donna Ashenmacher has stepped into the HAVO office for a detail as Administrative Technician.

I&M would like to welcome two volunteers, Danielle McKay and Jeff Hjelt who have joined the I&M Water Quality team for a few months.

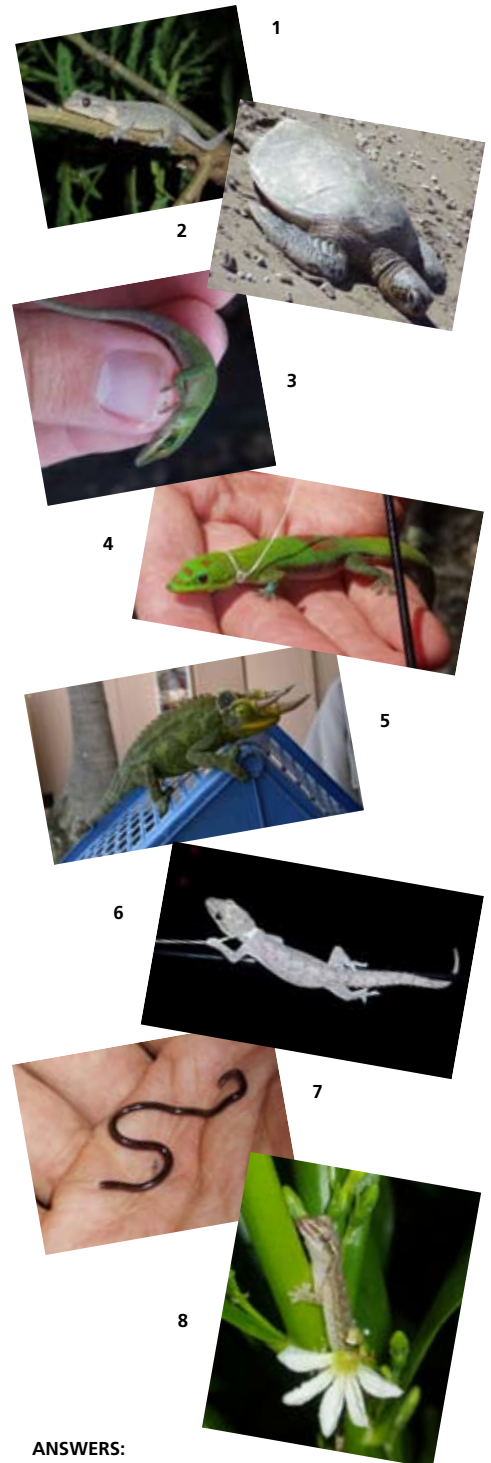
Data news: The Early detection of invasive plants database will be adopted by the Big Island Invasive Species Committee. Bullies to Kelly Kozar for her work on that important partnership building tool.



Games Corner

Are You a Hawai'i Herpetophile?

Several species of herpetofauna (reptiles and amphibians) can be found in West Hawai'i national parks. Can you name the species below?



ANSWERS:

- 1-Stump-Toed Gecko (*Gehyra mutilata*)
- 2-Green Sea Turtle (*Chelonia mydas mydas*)
- 3-Green Anole (*Anolis carolinensis*)
- 4-Gold Dust Day Gecko (*Phelsuma latcauda latcauda*)
- 5-Jackson's Chameleon (*Chamaeleo jacksonii xantholophus*)
- 6-House Gecko (*Hemidactylus frenatus*)
- 7-Blind Snake (*Ramphotyphlops delicata*)
- 8-Mourning Gecko (*Lepidodactylus lugubris*)

Calendar • Jan. - Mar. , 2007

- Jan. 5 = Network staff lectures
- Pacific University students about the I&M program and monitoring issues
- Jan. 16 = Staff presented the uses and importance of GIS mapping to natural resource management at HAVO after dark public program
- Jan. 22 = Technical Committee meeting at HAVO
- Jan. 24-26 = I&M program WASO study group at HAVO
- Jan. 29-31 = I&M program WASO study group at HALE
- Jan 30-Feb. 1 = GIS workshop presented by I&M at HALE
- Feb. 26-28 = Team building workshop for I&M at HAVO
- Feb. 21-23 = Meeting to discuss sampling and equipment for bat monitoring at HAVO. Expert D. MacKenzie and UCBN's T. Rodhouse attend.
- Mar. 12-13 = Bats protocol developers site visit to HALE
- Mar. 5-9 = Modeling workshop in Honolulu. NPS staff attend.
- Mar. = Water quality staff test field equipment for protocol.



Benthic Marine Resources in American Samoa

Description: Hermatypic corals are the basis of the coral reef ecosystem. These tiny colonial animals utilize nutrients found in seawater to form their limestone skeletons. As individual coral colonies die and new generations colonize the reef, this calcium carbonate (CaCO_3) base can become several kilometers thick. While all this building is occurring, other creatures are living on the reef as well, sometimes digging in or tunneling through the CaCO_3 matrix in a process known as bioerosion. Together this build-up and break-down of the reef develops a very complex and diverse habitat. It is this complexity which allows many organisms to simultaneously inhabit the reef within their own small habitat niches. In general terms, as the structural complexity of the reef increases so does the biodiversity. It is for this reason that coral reefs are one of the most ecologically diverse habitats on the planet, rivaled in biodiversity only by tropical rainforests on land. In the Pacific Ocean basin, largely due to its age, the greatest numbers of species occur as they have had a greater time period in which to adapt, diversify, radiate and speciate. In the National Park of American Samoa



The Crown-of-thorns siphonfish (*Siphamia fuscolineata*) is a small cardinalfish which lives commensally within the venomous spines of the crown-of-thorns seastar. It is one of the 44 fish species recently discovered in American Samoa.



Giant clams (*Tridacna* spp.) which were once a common and colorful inhabitant of the Samoan reefs are now only seen in deeper waters, and usually only in the cryptic color phases

(NPSA) coral reefs line the entire coastline on all three park units (Tutuila, Ofu, and Ta'u). As a result, NPSA has over 250 different corals, 700 molluscs (mostly marine snails), and 900 species of nearshore reef fish, as well as thousands of other invertebrate species.



Coral reef communities at NPSA



Continued on Page 7.....



Benthic Marine Resources — Continued

Cultural Significance: Like most other island cultures, the Samoan people traditionally had a great need for the resources available from the sea. Samoans, by way of cultural taboos and chiefly decrees, even had some of the first marine protected areas, allowing species to recover and repopulate the reefs for future generations. Unfortunately, with a greater human population and ever increasing demands, the populations of many traditional fisheries have collapsed. For example, the once common giant clams (*Tridacna spp.*, opposite page), known in Samoan as Faisua, are now rarely seen in the shallow waters easily accessible to local fisherman.



A coral reef community at NPSA

Inventories: Recently, a major push has occurred at NPSA to characterize and identify the species found within the reef communities. So far, there have been 44 new fish species sightings, including at least one (*Ostorhinchus leslie*), if not several, which are new to science. But NPSA and our reefs are not only home to fish. Two sea turtles can be found at NPSA, the endangered hawksbill turtle (*Eretmochelys imbricata*) and the threatened green turtle (*Chelonia mydas*). In addition, 17 marine mammals identified in a multi-year survey effort by researchers from the Hawaiian Humpback National Marine Sanctuary. In 2006, at least one humpback whale (*Megaptera novaengliae*) is thought to have given birth within park waters.

Monitoring: NPSA marine biologists, with help from University of Hawaii, Kalaupapa National Historical Park and National Oceanic and Atmospheric Association staff have recent-

ly conducted the inaugural year of the Inventory and Monitoring Program (I&M) benthic marine monitoring protocol. Survey work was also conducted for the I&M fish protocol currently under development. In February 2007, fifteen permanent survey stations were installed on the Tutuila unit of NPSA and field data was collected. Currently NPSA is finishing out this year's monitoring by completing data collections from 15 random sites in the park.

high and recolonization of the reefs is certainly achievable in the near future as the reefs remain relatively intact. During monitoring efforts this year, a near-pristine reef was found within park waters. Previously unknown, this reef showcased amazing biodiversity including numerous humphead wrasse (*Cheilinus undulatus*) and a pair of giant grouper (*Epinephelus lanceolatus*). These sightings provide great hope of repopulating the surrounding areas.



Humbag dascyllus (*Dascyllus aruanus*) swimming above antler coral

Humpback whales (*Megaptera novaengliae*) are transient yearly visitors to NPSA. They come up from their Antarctic feeding grounds from August-October to calve in the shallow warm waters surrounding American Samoa. Photograph taken under NOAA fisheries permit #774-1714

Data entry is ongoing and a database is being developed.

Status & Trends: Currently NPSA and American Samoa in general, lack sufficient law enforcement capabilities to adequately combat the significant problems of over-fishing, and poaching. Few large fish or apex predators remain on the reefs which is having dramatic effects on the population assemblages of fish and other reef inhabitants. Coral coverage remains

Conservation and Management: Like many other parks, the protection and preservation of NPSA's natural resources is one of the top management priorities. Inventory and monitoring practices using the newly developing I & M protocols will continue to be a major focus in order to gain enough data so that trends over time can be more easily discerned.

For more information:

<http://www.nps.gov/npsa/naturescience/index.htm>



Pu‘uhonua o Hōnaunau NHP — Hawai‘i

The last remaining intact pu‘uhonua, or place of refuge in Hawaii exists in Hōnaunau in the district of South Kona, Island of Hawai‘i. Pu‘uhonua were an integral part of the Hawaiian culture and kapu belief system. An individual who broke kapu (system of religion and law) could be reprieved from punishment of death if he or she could reach a pu‘uhonua. These areas also provided a safe haven for women, children, elderly, and non-combatants in war.

The importance of preserving the pu‘uhonua at Hōnaunau has been recognized for over 100 years. The great wall was partially restored in 1902 and 1912, and the area was recognized as having national significance in 1935. Finally, Pu‘uhonua o Hōnaunau National Historical Park was established in 1961 for “the benefit and inspiration of the people.” The park was erroneously named the “City of Refuge” which was corrected in 1978. On August 30, 2006, an additional 238 acre parcel of adjacent land, Ki‘ilae, was officially acquired by the National Park Service through the diligence of The Trust for Public Land, and congressional support. The park now spans the coast along three ahupua‘a, starting at Hōnaunau, through Keokea, and to the southern boundary of Ki‘ilae.

Cultural Resources: Pu‘uhonua o Hōnaunau (original park boundary) was listed on the National Register of Historic Places in 1966. Twenty-one historical structures are on the NPS List of Classified Structures and include such archaeological features as the Great Wall, Hale o Keawe, and several structures within Ki‘ilae Village. The Great Wall delineates the pu‘uhonua, Hale o Keawe was the mausoleum for chiefs in the area, and Ki‘ilae was the supporting village which is full of archeological features such as house complexes, learning heiau, and fishing shrines.

Natural Resources: Though the park’s history of ranching and associated non-native vegetation from that era remains dominant, a few areas that support native species and habitat remain. They are principally the coastal strand, anchialine pools, and cliff areas.



Above: Palms reflect off of the serene Makaloa pond. **Right:** Pōhuehue (*Ipomoea* spp.) blooms as it has for generations.



In addition, green sea turtles frequently bask on the shores of Keone‘ele cove. And flying the sky above them, Hawaiian hoary bats and shorebirds feed along the coast. Charismatic mini-fauna include anchialine pool shrimp, and possibly the endangered orange-black damselfly. Whales, dolphins, and sharks can be seen offshore from the park.

Twenty loulu palms (*Pritchardia affinis*) were outplanted near the new building and visitor center through collaboration between the park and the Tropical Reforestation & Ecosystems Education Center in 2006. Other endangered plants are maintained as part of a botanical garden, Kīhāpai uka, in a three acre detached parcel through a partnership with the Hawaii State Forestry and Wildlife Arboretum in Hilo.

Inventory and Monitoring

Highlights: Inventories of the park’s reptiles, shorebirds, anchialine pools, and bats have been completed. I&M documentation of bat presence paved the way for detection research that began in February, 2007. Also, results from the analysis of pond sediments are now available (in draft). This paleoenvironmental study was made possible through a partnership between the park and I&M.

Current Issues in Management: The majority of the park’s acreage is dominated by invasive, non-native vegetation. These invasive species damage archaeological features, out compete native species, and are an inaccurate representation of the historical landscape that the NPS tasked to preserve. Coastal strand and anchialine pool habitats display the highest

density of native plants, though only in discrete pockets.

Non-native animals also create management concerns. Goats and pigs have been in the park on numerous occasions, despite fencing efforts around the original 182-acre park boundary. The new Ki‘ilae parcel is not yet fenced and is under threat of damage to cultural and natural resources by feral ungulates. Feral cats and mongoose frequent the picnic area where they can often successfully beg food from humans. Moreover, the royal fishponds are full of non-native, non-culturally appropriate fish. Finally, Coqui frogs have just been reported to be present in the upland garden parcel.

Erosion of cultural resources along the coast continues to be a challenge as subsidence and sea level rise continue, especially during winter high surf events. The balance between protecting the landscape, cultural resources, and natural resource values is challenging. The park has maintained the sandy beach at Keone‘ele cove by importing crushed coral after high surf events. Currently, geotextile cloth anchored with concrete stepping stones has been placed to protect the cultural layer from further erosion while a long-term solution is sought.

Future management plans include fencing the Ki‘ilae parcel and restoration efforts along the coastal strand and the fishponds. More information is needed to define reasonable and attainable resources management goals that will address the big challenges created by non-native species and erosion.



The sun setting behind the pu‘uhonua paints a pink and black picture of times past

Come visit us:

This historical park is located in South Kona on the island of Hawai‘i.

On the web at: <http://www.nps.gov/puho/>